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## VII RECOMMENDATIONS

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### RESCISSION BILL TIMBER SALES

*What immediate restoration opportunities exist concerning the two 1995 Rescissions Bill timber sales to comply with the Biological Opinion (March 18, 1997) regarding coho salmon?*

According to the terms and conditions of the recent Biological Opinion between the BLM, USFS, and NMFS concerning the Southern ESU of coho salmon, newly constructed roads that remain as part of the permanent transportation system within a Key Watershed (Tier 1) should have an equivalent amount of road removed. The guidelines for road removal involve restoring the hydrologic condition of the site, which can be accomplished through a 'full' decommission procedure (refer to Western Oregon Transportation Management Plan 1996 pg.14 for details). Semi-permanent roads are to be winterized prior to wet seasons and 'fully' decommissioned within one year following activities they were built to access (including site preparation/burning).

The North Fork Chetco and Crazy 8's timber sales resulted in the construction of 2.8 miles of permanent road and 1.8 miles of semi-permanent road (refer to Appendix D, Table D-3 for road listing). In order to comply with the Biological Opinion, 2.8 miles of road needs to be removed from the transportation system. The TMO process identified 5.5 miles of road within the Key Watershed that can be fully decommissioned to meet this objective (refer to Appendix F-2 for TMO list). The additional miles over the 2.8 figure can be 'credited' towards the 'no-net increase' concerning road construction within this Key Watershed. (For list of additional roads outside the Key Watershed, see Restoration subpart, this Section)

<u>Recommendation</u>	<u>miles</u>	<u>Road System/Area</u>
Full decommission	4.64*	16 inventoried roads (see Appendix F-2)
Full decommission	0.83**	Morton Butte Ridge Rd.(see Appendix F-2)

\* The North Fork Chetco timber sale resulted in the construction of 0.7 miles of permanent road within LSR #251. Included in the 4.64 miles of road to be fully decommissioned is 0.6 miles within LSR #251.

\*\* The Morton Butte Ridge Road was reopened for management access earlier this decade and portions of it are currently rechanneling stream flow. This lower .8 miles is recommended for restoration to resolve this problem and the remaining portion of this road is still available to remove additional mileage.

- Some roads subject to closure may be subject to reciprocal right-of-way agreements. Prior to any change in road status, consultation with South Coast Lumber Company is necessary in accordance with Instruction Memorandum OR-95-87.

*What immediate restoration opportunities exist concerning the two 1995 Rescissions Bill timber sales to mitigate impacts on the LSR?*

The North Fork Chetco timber sale harvested 72 acres of late-successional habitat within the LSR, 57 acres of which are also located in the North Fork Chetco Area of Critical Environmental

Concern (ACEC) (refer to Appendix D, Table D-3 for listing of unit acreages).

- Plant conifer within the road clearing limits, including fill slopes, of Road No. 40-13-9.0 in Section 28/33. This portion of road was reconstructed with a very wide clearing limit (50 to 80') leaving it void of trees.
- Silvicultural treatments (planting, pct, maintenance) should focus on restoring the species mix and spacing to the Rescission Act units as well as other existing plantations. Projects should encourage more conifers along streams and a lower density of conifers on hill slopes and ridgetops. See the Coos Bay District LSR Assessment for southwest Oregon for silvicultural recommendations for LSRs. The LSR Assessment, however, placed a low priority for silvicultural restoration projects in the North Fork Chetco LSR in the context of other LSRs in southwest Oregon.

## **KEY WATERSHED MANAGEMENT ACTIVITIES**

### **What management activities are appropriate within the Key Watershed?**

The scope of a watershed analysis defines which activities are appropriate within Key Watersheds. Those management activities addressed in Section VI-Riparian Reserve Evaluation that are suitable within Riparian Reserves (Table IV-4) are also appropriate within this Key Watershed. Regen harvest activities within the Key Watershed should be assessed in a subsequent iteration. As previously mentioned, site-scale analysis will determine the extent to which these can occur.

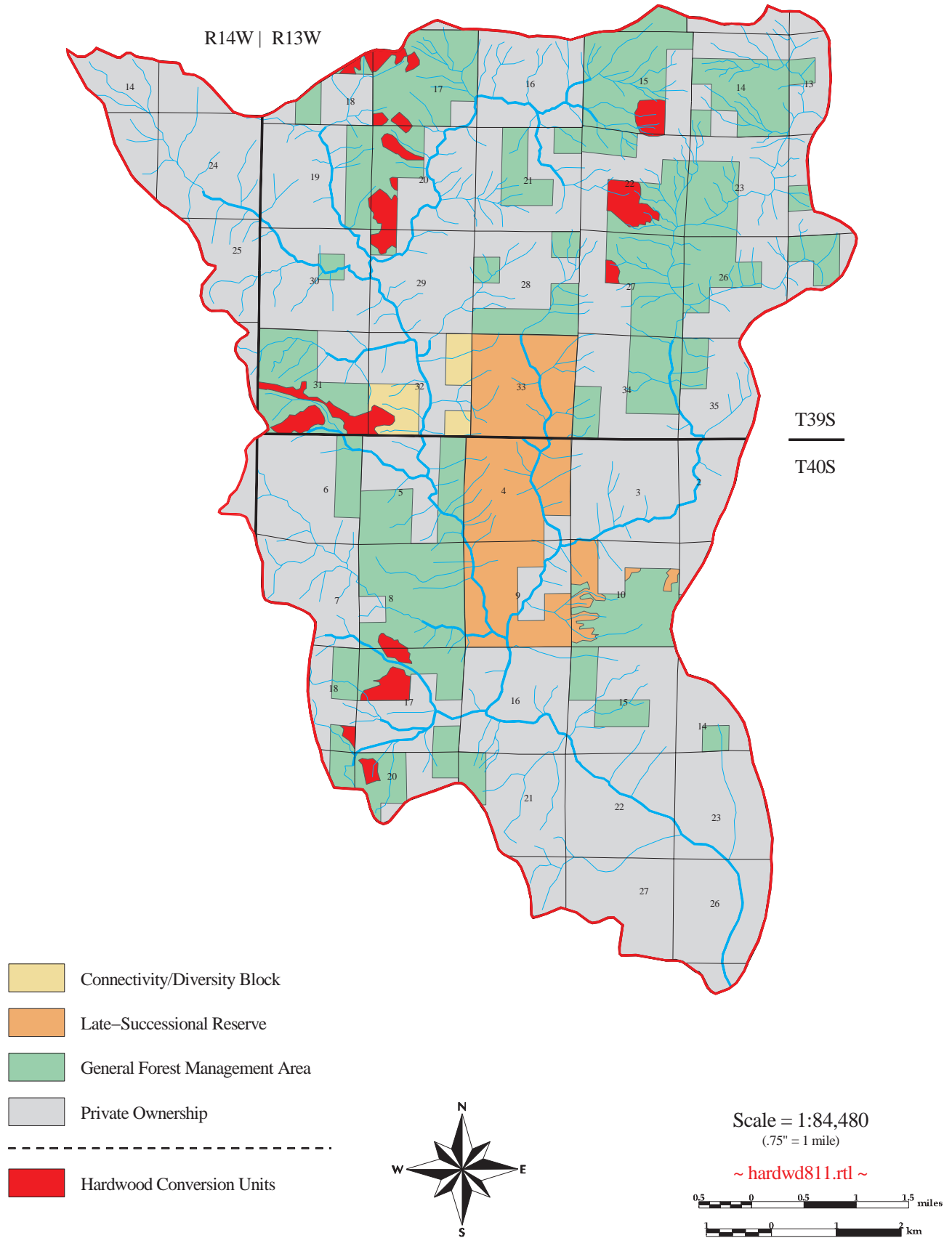
## **FOREST MANAGEMENT**

### ***What areas are suitable for hardwood conversion opportunities to meet the District's RMP commitment?***

The first step in the selection process was the development a GIS map of all available hardwood dominated stands and brushfields. The map identified areas only within GFMA and CONN designated lands; not located within Riparian Reserve, "Withdrawn" Timber Production Capability Classification allocated lands, or other administratively withdrawn areas. These initial areas were then reviewed in the field to determine the stand stocking/composition, stand size suitable for commercial harvesting, the physical loggability, and proximity to existing roads. This step resulted in identifying 614 acres of potential conversion opportunities (Figure VII-1). Other areas may be suitable for conversion opportunities depending upon further field evaluation.

For proposed areas within the Bosley Butte and Upper Bravo hydrologic units, further analysis is required to assess the risk of elevated peak flow from the harvest in the transient snow zone. A higher priority could be placed on conversion areas from which conifers had been removed from the stand from previous timber harvested or human-caused fires. Lower priority on hardwood stands resulting from soil limitations and natural disturbances. Detailed specifics, such as selection of logging systems, specific unit prescriptions and final unit boundaries, will be addressed through the NEPA process. In addition, project areas will require pre-project surveys for Del Norte salamanders.

# Figure VII-1 Potential Hardwood Conversion Areas



## RESTORATION

The following recommendations are prioritized by restoration category in order to better target which type of activity to pursue first and seek opportunities for funding. These categories were prioritized based on the following concept of; reducing erosion and sediment delivery first, removing barriers on fish bearing streams second, decreasing water temperature third, and improving aquatic, riparian, and terrestrial habitats fourth. Individual projects within each category have not been prioritized.

### Erosion and sediment delivery

#### Road culverts

- The TMO process identified the following roads which contain sedimentation concerns primarily resulting from the lack of adequate drainage. Structures could be installed with the "Jobs-in-the-Woods" program or timber sales, whichever is applicable. A culvert inventory is needed to properly address the location of additional structures. Installation/ replacement of drainage structures has been identified on the following roads, but is not limited to:

<u>Road System</u>	<u>Recommendation</u>	<u>miles</u>
39-13-15.0	install drain dips	0.6
39-13-30.01	culvert installation	0.5
40-13- 2.0 Seg. B	culvert installation	0.5
40-13-19.0 Seg. E	culvert installation	0.3

\* 'culvert installation' involves replacement of existing non-functioning culverts as well as installing additional culverts.

- In addition, a culvert inventory identified specific locations which contain culverts that are not functioning properly or are undersized. (refer to Appendix F-3 for specific locations and size recommendations)

<u>Road System</u>	<u>Recommendation</u>	<u># culverts</u>
39-13-14.0	install drain dips	2
39-13-12.3	culvert installation	2
39-13-20.0	culvert installation	1
40-13- 5.2	culvert installation	1
1000 Road (on BLM lands)	culvert installation	4

- For the roads within the Bosley Butte area, the recommended method of resolving the drainage concern is to construct drain or rolling dips (See Appendix F-4 for design specifications). These roads are located in or close to the snow zone, are in raveling-type soils, and do not receive frequent maintenance. Under these conditions, culverts would be filled in with soil, resulting in runoff 'diverting' down the road surface.

- Due to the high erodibility of most all soil types within the analysis area any culvert outlet within these soils should not be 'shotgunned' and stream culverts should be placed on the original stream gradient. Add energy dissipaters at all outlets, unless natural

ground conditions prevent erosion. Road fills over the large (i.e., 48") culverts should be armor-plated on both inlet and outlet to reduce erosion of the fill.

- Prior to construction or replacement of existing worn out or degraded culverts, stream inventories should be conducted to determine potential impacts to aquatic amphibians. Where appropriate and possible, facilitate upstream movement of aquatic amphibians through new culverts by placing culverts on or slightly below stream grade, with outlets in contact with the stream bottom. In areas where high habitat quality exists and non-jumping special status species are present, add roughening baffles to culverts to collect gravel throughout the culvert-bottoms.

#### Road maintenance

- Conduct annual road maintenance on the stream crossing fill near the end of Road No. 40-13-8.1 to ensure the water dips from the landing area are functional. This section is adjacent to an active rotational cut-bank slump and is a source of sedimentation into the adjacent stream. The back portion of the road can be fully decommissioned following the harvest of the residual timber.
- Construct waterdips or "flavels" on short, low traffic volume roads. Special consideration should be given to their location on highly erodible soil types or within the transient snow zone. Opportunities for such work can occur as part of timber sale final road maintenance or part of normal scheduled maintenance.

#### Road slumps

- Stabilize rotational cut-bank slumps on Road No. 40-13-5.2 by installing rip-rap type material at the toe of the cutbank. Use geo-tech fabric underneath to prevent moisture from coming to the surface and to add strength to the rock blanket.

#### Road closures

- The TMO process recommended 6 roads to be closed outside of the Key Watershed. This could be accomplished through "Jobs-in-the-Woods" programs or upcoming timber sales in the area. TMOs for individual roads are listed in see Appendix F-2. (For list of roads to be closed within the Key Watershed, see first page this Section).

<u>Recommendation</u>	<u>miles</u>	<u>Road System/Area</u>
Decommission/Full D'com.	1.8	Black Mound area

#### Cooperation with adjacent landowners

- Cooperate with South Coast Lumber Company, adjacent landowners, or through the Chetco Watershed Council to conduct road/culvert inventories which would aid in reducing sediment delivery to the stream network or identifying possible barriers to fish passage. Funding for restoration opportunities may be available through the Chetco Watershed Council or the Wyden Amendment to the "Jobs-in-the-Woods" program.

## **Fish passage barriers**

- Remove culvert at Mayfield Creek where it crossed Road No. 40-13-5.1 (T.40 S., R.13 W. Sec. 17 NWNW). Replace with structure that restores fish passage and maintains connectivity for all other aquatic organisms.

## **Water temperature** (general guidelines for riparian silviculture is listed in Appendix G)

- Work with the Chetco Watershed Association, adjacent landowners, and South Coast Lumber Company to formulate strategies to reduce water temperatures along the North Fork Chetco. Listing on the 303(d) list by the Oregon Department of Environmental Quality highly recommends cooperative efforts among landowners to conduct restoration opportunities. Riparian silviculture projects to re-establish large conifers, which would eventually provide shade, would be very beneficial. These projects could also provide missing habitat features, such as large wood, and provide habitat and connectivity for riparian species.
- Explore the possibility of cooperative riparian projects among BLM, private landowners, and the Watershed Association to restore large conifers and large wood to the lower three reaches of the North Fork Chetco River.

## **Habitat improvement**

### Special Habitats

- Restore meadow habitats on BLM lands in the Morton Butte area (Sec. 6., T.40 S., R.13 W.) and upper part of Ransom Creek (Sec. 22., T.39 S., R.13 W.) in an open or early seral stage by removal of encroaching trees through control burning or cutting. Provide down log habitat along edges of meadows when possible to serve as habitat for sharptail snakes, small mammals, and other species.
- No management actions to maintain knobcone pine stands are needed at this time. Given the slow rate of growth in these stands, substantial time will pass before the encroachment of Douglas-fir will have an effect on this plant community.

### Species of concern

- Restrict road widening in area where golden fleece (*Ericameria arborescens*) occurs along Bosley Butte Road.

### Aquatic Habitat (general guidelines for in-stream projects is listed in Appendix G)

- Conduct aquatic habitat inventories on Cassidy Creek, Mayfield Creek, Upper North Fork Chetco River, and in other areas where inventory data is unavailable or incomplete.
- Retain all log jams and wood structure unless there is impending risk of damage to the environment or property.

- Placement of short logs and boulder weirs is not appropriate for type-C channels in the North Fork Chetco analysis area. Short logs will be easily transported, and boulder weirs would become buried in alluvial sediments.
- Woody material intercepted by roads during storm events should be incorporated back into the stream channel.

#### Riparian Habitat

- Conduct additional riparian surveys as necessary to develop a more comprehensive understanding of riparian plant communities, especially in fire-established tanoak stands, and in the Bravo Creek reference reach.
- Look for opportunities to use prescribed fire to treat Riparian Reserves adjacent to harvest units during site preparation burning. The use of low-intensity understory burns can be used to facilitate development of desired plant communities, modify fuel loading and continuity, and reduce the risk of catastrophic fire in riparian areas.

#### Terrestrial Habitat

- Create snags and down logs in areas currently deficient in these structures. In Reserve areas, manage snags for 100% cavity nester potential (refer to Section V.2 -Terrestrial Habitat) and down logs within the range of natural variability in unmanged stands (see Table V-3). Landscape scale inventories should be used to identify specific areas or landscape strata where snag and down log habitats are deficient. Reserve areas should receive the highest priority for snag and down log creation projects. See the LSR Assessment for Southwest Oregon (1997) for additional guidance on snag and down log habitat in Reserve areas.
- During pre-commercial thinning treatments, consider creating 1 small snag per acre in areas dominated by early and mid-seral stands which contain few snags.
- If necessary to cut snags for safety or other reasons, leave stumps as high as possible (5 feet or so) so they can continue to function as habitat for some bat and other species.
- The possibility of using prescribed fire to facilitate development of late-successional habitat characteristics in the LSR was assessed. Late-successional habitat is still being harvested on Matrix lands before similar habitats have a chance to develop on LSRs. This situation creates a bottleneck in the next few decades for species dependent on these habitats. Additional stand disturbance in existing mature/late-successional stands would only further restrict the bottleneck; therefore, prescribed fire projects in mature/late-successional stands in the LSR may not be prudent for the next couple decades.

## **MONITORING**

- Separate monitoring plans (i.e., wildlife; aquatic/stream channel) which address habitat components, species, physical features, and projects have been developed or are in development. See the separate monitoring plans for further recommendations on monitoring needs.

- Monitoring stream flow along the North Fork Chetco River is planned by the construction of a gaging station at the bridge crossing the North Fork Chetco River (Road No. 40-13-25.0)
- Monitoring of individual projects will be addressed as part of the site-specific NEPA process.

## **DATA GAPS**

- More accurate mapping of the FOI database, especially in the northeast portion of the analysis area and recent burn areas classified as ‘tanoak’ or ‘brushfield conversion’.
- Vegetation/habitat information throughout the analysis area, including field surveys to determine reference stands.
- Information specific to the North Fork Chetco is needed on precipitation intensity, stream flow, and sediment delivery (including bedload).
- Field verification on the amount of intermittent streams to more accurately calculate the Riparian Reserve acreages for the Level 1 Riparian Reserve Evaluation.
- Habitat inventory and fish distribution information on Cassidy, Upper NF Chetco, Bosley Butte, and the smaller tributaries to NF Chetco mainstem.
- Surveys to determine the distribution and relative abundance of protection buffer, Survey & Manage, and special status species.



## Literature Cited:

- Adams, W. T. et al. 1992. Reforestation Practices in Southwestern Oregon and Northern California. Forest Research Laboratory, Oregon State University, Corvallis.
- Agee, J.K. 1991. Fire history of Douglas-fir forests in the Pacific Northwest. In L.F. Ruggiero, K.B. Aubry, A.B. Carey, M.H. Huff, techn. coords. Wildlife and vegetation of unmanaged Douglas-fir forests. Gen. Tech. Rep. PNW-GTR-285. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. pp 25-33.
- Agee, James K. 1993. *Fire Ecology of Pacific Northwest Forests*. Island Press. ISBN 1-55963-229-1.
- Anderson, N.H. and J. R. Sedell. 1979. Detritus processing by macroinvertebrates in stream ecosystems. *Ann. Rev. Entomol.* 24:351-377.
- Andrus, C.W. and H.A. Froehlich. 1992. Wind damage within streamside buffers and accelerated sedimentation. *COPE Report.* 5(1&2):7-9.
- Atzet, T., D.L. Wheeler. 1982. Historical and ecological perspectives on fire activity in the Klamath Geological Province of the Rogue River and Siskiyou National Forests. USDA Forest Service, Pacific Northwest Region, Portland, OR. R6-Range-102-1982.
- Atzet, T., et al. 1996. Field Guide to the Forested Plant Associations of Southwestern Oregon. Technical Paper R6-NR-ECOL-TP-17-96. Forest Service, USDA, Pacific Northwest Region.
- Beschta, B.L. 1996. Personnel communication.
- Beschta, B.L., Bilby, R.E., Brown, G.W., Holtby, L.B., and Hofstra, T.D. 1987. Stream temperature and aquatic habitat: fisheries and forestry interactions. Chapter Six In: *Streamside Management, Forestry and Fishery Interactions*. Edited by E.O. Salo, and T.W. Cundy. Contribution No. 57. Institute of Forest Resources. University of Washington, Seattle, Washington. pp. 191-232.
- Bingham, B.B. and J.O. Sawyer Jr. 1991. Distinctive features and definitions of young, mature, and old-growth Douglas-fir/hardwood forests. In L.F. Ruggiero, K.B. Aubry, A.B. Carey, M.H. Huff, techn. coords. Wildlife and vegetation of unmanaged Douglas-fir forests. Gen. Tech. Rep. PNW-GTR-285. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. pp 362-377.
- Blaustein, A.R., J.J. Beatty, D.H. Olson, R.M. Storm. 1995. The biology of amphibians and reptiles in old-growth forests in the Pacific northwest. Gen. Tech. Rep. PNW-GTR-337. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 98 p.
- Bureau of Land Management (BLM). 1972. Physical and biological stream survey. Reports on file in Myrtlewood Resource Area, Coos Bay District BLM, North Bend, Oregon, and at ODFW, Gold Beach, Oregon.
- Bureau of Land Management (BLM). 1994. Port-Orford Cedar Management Guidelines, September, 1994
- Bureau of Land Management (BLM) 1995. Riparian vegetation inventory conducted by M. Rodriguez and J. Colby. Data on file in the Myrtlewood Resource Area of the Coos Bay District, Bureau of Land Management, North Bend, OR.
- Bureau of Land Management (BLM). 1997. Electrofishing survey for fish presence/absence, May-June, 1997. Records and reports on file in Myrtlewood Resource Area, Coos Bay District BLM, North Bend, Oregon.
- Busby, P.J., Wainwright, T.C., and Waples, R.S. 1994. Status review for Klamath Mountains Province

steelhead.

U.S. Dep. Commer., NOAA Tech. Memo. NMFS-NWFSC-19. 130 pp.

Carey, A.B. 1991. The biology of arboreal rodents in Douglas-fir forests. Gen. Tech. Rep. PNW-GTR-276. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific northwest Research Station. 46 p.  
(Huff, M.H., R.S. Holthausen, K.B. Aubry, tech. coords.; Biology and management of old-growth forests).

Christensen, M.J. 1996. Effects of Stream Restoration on Macroinvertebrate Communities in an Oregon Coast Range Stream. MS thesis, Oregon State University, Corvallis, OR.

Christy, R.E., and S.D. West. 1993. Biology of bats in Douglas-fir forests. Gen. tech. Rep. PNW-GTR-276. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 28 pp.

Cline, S.P.; A.B. Berg; H.M. Wight. 1980. Snag characteristics and dynamics in Douglas-fir forests, Western Oregon. J. Wildl. Manage. 44(4):773-786.

Cooney, C.X., and Jacobs, S.T. 1997. Oregon coastal salmon spawning surveys, 1994 and 1995. Information Reports No. 97-5. Oregon Department of Fish and Wildlife. Portland, OR. 204 pp.

Cooney, C.X., and Jacobs, S.T. 1994. Oregon coastal salmon spawning surveys, 1992. Information Reports No. 94-2. Oregon Department of Fish and Wildlife. Portland, OR. 103 pp.

deMaynadier, P.G. and M.L. Hunter, Jr. 1995. The relationship between forest management and amphibian ecology: a review of the North American literature. Environ. Rev 3:230-261.

Farnell, J.E. 1981. Curry County rivers navigability report. Division of State Lands. Salem, Oregon. 12 pp.

FEMAT. 1993. Forest ecosystem management: An ecological, economic, and social assessment. Interagency Report.

Franklin, Jerry F. and C.T. Dyrness. 1973. *Natural Vegetation of Oregon and Washington*. Oregon State University Press.

Franklin, J.F., K. Cromack, W. Denison, and others. 1981. Ecological characteristics of old-growth Douglas-fir forests. General Technical Report, PNW-118. Pacific Northwest Forest and Range Experiment Station. 48 pgs.

Furniss, M.J., Roelofs, T.D., and C.S. Yee. 1991. Road construction and maintenance. American Fisheries Society Special Publication 19:297-323.

Geier, T.W. and D.L. Loggy. 1995. A geomorphic risk assessment of potential fish habitat impacts from forest management in southeast Alaska. USDA Forest Service, Tongass National Forest. 18p.

Goward, T. 1992. Epiphytic lichens down with the trees. In Rautio, S. Ed. Proceedings of the Symposium, Community Action for Endangered Species. Sept 1991, Vancouver B.C., Canada. pgs 153-158.

Great Gray Owl Survey Protocol. 1995. Survey protocol for the great gray owl (*Strix nebulosa*). Transmitted to the BLM in a memo dated 12 May 1995 from Regional Interagency Executive Committee Members, Californai Federal Executives.

Groot, C. and L. Margolis eds. Pacific Salmon Life Histories. UBC Press, Vancouver, B.C. Pp. 564.

Habeck, J.R. 1968. Forest succession in the Glacier Peak cedar-hemlock forests. Ecology, 41:872-880.

Harlow, W. M. and E. S. Harrar. 1969. Textbook of Dendrology. McGraw-Hill, New York.

- Harr, R.D., R. L. Fredrickson, and J. Rothacher. 1979. Changes in streamflow following timber harvest in southwest Oregon. USDA Forest Service. Res. Pap. PNW-249; 22pp.
- Harrington, T.B. and J. C. Tappeiner II. Unpublished. Growth Response of Young Douglas-fir and Tanoak 11 years after Various Levels of Hardwood Removal and Understory Suppression in Southwestern Oregon.
- Healey, M.C. and F.P. Jordan. 1984. Inter- and intra-population variation in the fecundity of chinook salmon (*Oncorhynchus tshawytscha*) and its relevance to life history theory. Can. J. Fish. Aquatic Science. 41:476-483.
- Huff, M.H., R.S. Holthausen, K.B. Aubry. 1992. Habitat management for red tree voles in douglas-fir forests. Gen. Tech. Rep. PNW-GTR-302. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 16 pp.
- Hynes, H.B.N. 1970. The Ecology of Running Waters. Liverpool University Press, Liverpool. 555 pp.
- Jones, J.A., and G.E. Grant. 1996. Peak flow responses to clear-cutting and roads in small and large basins, western Cascades, Oregon. American geophysical Union, Water Resources Research, vol. 32.
- Konopacky, R.C. 1984. Sedimentation and productivity in a salmonid stream. Doctoral dissertation. University of Idaho, Moscow, ID.
- Lisle, T.E. 1987. Overview: channel morphology and sediment transport in steepland streams. In Beschta, R.L., Blinn, T., Grant, G.E., Ice, G.G., and Swanson, F.J., (editors). Erosion and sedimentation in the Pacific Rim. Proceedings of the Corvallis Symposium, August, 1987. International Association of Hydrological Sciences Publication No. 165. p. 287-297.
- Marcot, B.G. 1991. Snag recruitment simulator model, ver 2.52w. March 8 1991. Based on Brown (1985).
- Maser C., B.R. Mate, J.F. Franklin, C.T. Dyrness. 1981. Natural history of Oregon coast mammals. USDA For. Serv. Gen. Tech. Rep. PNW-133. Pac. Northwest For. and Range Exp. Stn., Portland, OR. 496 p.
- McDonald, P. M. and D. W. Huber. 1995. California's hardwood Resource: Managing for Wildlife, water, Pleasing Scenery, and Wood Products. Gen. Tech. Report PSW-GTR-154. Albany, CA: Pacific Southwest Research Station, Forest Service, USDA.
- McFadden, J.T. and E.L. Cooper. 1962. An ecological comparison of six populations of brown trout (*Salmo trutta*). Transactions of the American Fisheries Society 91:53-62.
- Meehan, W.R. and M.L. Murphy. 1991. Stream ecosystems. In Meehan, W.R. (Ed) Influences of Forest and Rangeland Management on salmonid fishes and their habitats. American Fisheries Society Special Publication 19. Bethesda, MD. 751.
- Meinzer, O.E. 1923 Outline of ground-water hydrology, with definitions. U.S. Geological Survey Water-Supply Paper 494. 71 p.
- Neimiec, S. S. , G. R. Ahrens, S. Willits, and D. E. Hibbs. 1995. Hardwoods of the Pacific Northwest. Forest Research Laboratory, Oregon State University, Corvallis. Research Contribution 8. 115p.
- Neitlich, P.N. 1993. Lichen abundance and biodiversity along a chronosequence from young managed stands to ancient forest. M.S. Thesis, University of Vermont. 90 pgs.
- Nicholas, J.W., and Hankin, D.G. 1988. Chinook salmon populations in Oregon coastal river basins: description of life histories and assessment of recent trends in run strengths. Information Reports No. 88-1. Oregon Department of Fish and Wildlife. Portland, OR. 359 pp.

- Nickelson, T.E., Rodgers, J.D., Johnson, S.L. and M.F. Solazzi. 1992a. Seasonal changes in habitat use by juvenile coho salmon (*Oncorhynchus kisutch*) in Oregon Coastal Streams. *Can. J. fish. Aquat. Sci.*, 49:783-789.
- Nickelson, T.E., M.F. Solazzi, S.L. Johnson, and J.D. Rodgers. 1992b. Effectiveness of selected stream improvement techniques to create suitable summer and winter rearing habitat for juvenile coho salmon (*Oncorhynchus kisutch*) in Oregon coastal streams. *Can. J. Fish. Aquat. Sci.*, 49:790-794.
- Nickelson, T.E., J.W. Nicholas, A.M. McGie, R.B. Lindsay, D.L. Bottom, R.J. Kaiser, and S.E. Jacobs. 1992c. Status of anadromous salmonids in Oregon coastal basins. ODFW Report.
- NOAA. 1973. Precipitation-frequency atlas of the western United States. National Oceanic and Atmospheric Administration, National Weather Service, Silver Spring, Md. 43 plates.
- Nussbaum, R.A., Edmund D.B., Jr., and R.M. Storm. 1983. Amphibians and Reptiles of the Pacific Northwest. University of Idaho Press, Moscow, ID. 332 pp.
- ODEQ. 1988. 1988 Oregon Statewide Assessment of Nonpoint Sources of Water Pollution. Portland, Oregon: Oregon Department of Environmental Quality.
- ODEQ 1996. DEQ's 1994/1996 303(d) List of Water Quality Limited Waterbodies & Oregon's Criteria Used For Listing Waterbodies. Oregon Department of Environmental Quality, Portland, OR. 59p.
- ODFW and BLM. 1995. Aquatic Habitat Inventory Project - North Fork Chetco River. Reports on file in Myrtlewood Resource Area, Coos Bay District BLM and ODFW, Corvallis, OR.
- ODFW. 1997a. Personal communication with John Toman, Wildlife Biologist, Charleston, Oregon.
- ODFW. 1997b. Information provided by Todd Confer, Fisheries Biologist, Gold Beach, Oregon.
- Oregon Forest Industries Council. 1993. 1992 Oregon Stream Monitoring Project.
- Oregon State University (OSU). 1982. Average dry-season precipitation in southwest Oregon, May through September. OSU Extension Service, EM 8226.
- Oregon State University (OSU). 1993. Normal Annual Precipitation. Oregon Climate Service, 326 Strand Ag. Hall, OSU. 1 plate.
- Oregon State Water Resources Board (OSWRB). 1963. South Coast Basin. Salem, Oregon.
- Ripple, W.J. 1994. Historic spatial patterns of old forests in Western Oregon. *J. Forestry*. 92: 45-49.
- Pearcy, W.G. 1992. Ocean ecology of North Pacific salmonids. Books in Recruitment Fishery Oceanography. Washington Sea Grant, University of Washington Press, Seattle, 179 pp.
- Rosenberg, D.M. and V.H. Resh. 1993. Introduction to freshwater biomonitoring and benthic macroinvertebrates. In Rosenberg, D.M. and V.H. Resh (eds). *Freshwater Biomonitoring and Benthic Macroinvertebrates*. Chapman and Hall, New York, NY. 488 pp.
- Rosgen, D. L. 1994. A classification of natural rivers. *Catena* 22: pages 169-199.
- Sandercock, F.K. 1991. Life history of coho salmon (*Oncorhynchus kisutch*). Pages 395-445 in Groot C. and L. Margolis. *Pacific Salmon Life Histories*. UBC Press. Vancouver, BC.
- Schoonmaker, P., and A. McKee. 1988. Species composition and diversity during secondary succession of coniferous forests in the western Cascade Mountains of Oregon. *Forest Science* 34:960-979.

- Shaffer, M.L. 1981. Minimum population sizes for species conservation. *BioScience* 31:131-134.
- Spies, T.A. and J.F. Franklin. 1991. The structure of natural young, mature, and old-growth Douglas-fir forests of Oregon and Washington. In: *Wildlife and Vegetation of Unmanaged Douglas-fir Forests*. Aubry, K.A. and M.H. Brookes, Eds. PNW -GTR-285. pgs. 91-109
- Soule, M.E., *Ed.* 1987. *Viable Population Size for Conservation*. Cambridge University Press, Cambridge, U.K
- Strahler, A.N. 1957. Quantitative analysis of watershed geomorphology. *Trans. Amer. Geophys. Union*. 38:913- 920.
- Taylor, C.A., Melvin, W.L., Fitzpatrick, J.R., Hobbs, H.H. Jezerinac, R.F., Pflieger, W.L. and H.W. Robison. 1996. Conservation status of crayfishes of the United States and Canada. *Fisheries* 21(4) 25-38.
- Taylor, R .L. and P .W. Adams. 1986. Red Alder Leaf Litter and Streamwater Quality in Western Oregon. *Water Resources Bull.* 22(4):629-635
- Teensma, P.D.A., J.T.Rienstra, M.A. Yeiter. 1991. Preliminary reconstruction and analysis of change in forest stand age classes of the Oregon Coast Range from 1850 to 1940. T/N OR-9. U.S. Bureau of Land Management., Portland, OR.
- Tew, M.P. 1971. The Species Composition and Adaptations of Insects in an Intermittent Stream in Western Oregon. M.S. Thesis, Oregon State University, Corvallis, OR. 84 pp.
- Thomas, J.W., Tech. ed. 1979. .Wildlife habitats in managed forests: the Blue Mountains of Oregon and Washington. *Agri. handb.* 553. Washington, DC: USDA, Forest Service. 512pp
- Thorp, J.H. and Covich, A.P., eds. 1991. *Ecology and Classification of North American Freshwater Invertebrates*. Academic Press, Inc. San Diego, CA, pp. 676-677.
- Trappe, J.M. and D.L. Luoma. 1992. The ties that bind: Fungi in ecosystems. In: *The Fungal Community*, Carroll, G.C. and D.T. Wicklowm, Eds. Marcel Dekker, New York. pgs 17-27.
- U.S. Chief of Engineers. 1893. Report. p. 3431-32.
- USDA Forest Service. 1984. Preliminary Plant Associations of the Siskiyou Mountain Province. Technical Coordinators: T. Aztet and D. L. Wheeler. USDA Forest Service, Pacific Northwest Region. May 1984.
- US DA Forest Service. 1996a. Chetco River Watershed Analysis. Unpublished report on file at Coos Bay District, Myrtlewood Resource Area, BLM. April 24, 1996.
- USDA Forest Service. 1996b. Field Guide to Plant Associations of Southwestern Oregon. Technical Coordinators: T. Aztet, D.E. White, L.A. McCrimmon, P.A. Martinez, P.R. Fong, and V.D. Randall. USDA Forest Service, Pacific Northwest Region. R6-NR-ECOL-TP-17-96.
- USDA. 1997. Assessment of the Effects of the 1996 Flood on the Siuslaw National Forest. Harriet Plumley, Editor Siuslaw National Forest, April 28, 1997.
- U.S. Department of Agriculture/Department of Interior (USDA/USDI). 1994. Record of decision for amendments to Forest Service and Bureau of Land Management planning documents within the range of the Northern Spotted Owl.
- USFS. 1997. Personal communication with Angie Dillingham, Fish Biologist, Chetco Ranger District, Brookings, Oregon.

- Wellman, R.E., J.M. Gordon and R .L. Moffatt. 1993. Statistical summaries of streamflow data in Oregon. USGS Open-File Report 93-63.
- Welsh, H.H. Jr. and A.J. Lind. 1995. Habitat correlates of the Del Norte salamander, *Plethodon elongatus* (Caudata: Plethodontidae), in northwestern California. J. of Herpetology, Vol. 29, No. 2. pp. 198-210.
- Whittaker, R.H. 1960. Vegetation of the Siskiyou Mountains, Oregon and California. Ecol. Monogr. 30:279-338.
- Ziemer, Robert R. 1981. Some effects of silvicultural options on the stability of slopes. National Council Paper Industry for Air and Stream Improvement: Technical Bull. 344. 12pp.
- Zika, P. 1993. *Ericameria arborescens* in Oregon. A report submitted to USDA Forest Service, Siskiyou National Forest.
- Zybach, R. 1993. Native fires in the Northwest: 1788-1856, American Indians, cultural fire, and wildlife habitat. Northwest Woodl. 9(2):14-15, 30-31.